

FORM PTO-1390

U.S. Department of Commerce Patent and Trademark Office

Attorney's Docket No.
2576-116

**TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371**

U.S. Application No. (if known, see 37 CFR 1.5)
Not Yet Assigned

09/914595

INTERNATIONAL APPLICATION NO.
PCT/JP00/00004INTERNATIONAL FILING DATE
January 4, 2000

PRIORITY DATE CLAIMED

TITLE OF INVENTION
PORTABLE TELEPHONE**APPLICANT(S) FOR DO/EO/US**


Hiroaki NAGANO, Shinjiro FUKUYAMA, Kenji ITOH

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has **NOT** expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

ITEMS 11. TO 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A **FIRST** preliminary amendment.
☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: Courtesy copy of International Application PCT/JP00/00004 w/attached International Search Report in Japanese and English; 10 sheets of drawings; 3 cited reference.

U.S. APPLICATION NO. (If known, see 37 CFR 1.60) Not Yet Assigned 09/914595		INTERNATIONAL APPLICATION NO. PCT/JP00/00004		ATTORNEY DOCKET NO. 2576-116	
17. <input checked="" type="checkbox"/> The following fees are submitted: Basic National Fee (37 CFR 1.492)(a)(1)-(5): Search Report has been prepared by the EPO or JPO \$ 860.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) \$ 690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$ 710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$ 1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$ 100.00				<u>CALCULATIONS</u>	<u>PTO USE ONLY</u>
				ENTER APPROPRIATE BASIC FEE AMOUNT =	
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	6 -20 =	0	X \$18.00	\$	
Independent Claims	1 -3 =	0	X \$80.00	\$	
Multiple dependent claim(s) (if applicable)			+ \$270.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$ 860.00	
Reduction by 1/2 for filing by small entity, if applicable. Applicant(s) hereby claim small entity.				\$	
SUBTOTAL =				\$ 860.00	
Processing fee of \$130.00 for furnishing the English translation later [] 20 [] 30 than months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$ 860.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+	\$ 40.00
TOTAL FEES ENCLOSED =				\$ 900.00	
				Amount to be refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> Two checks totaling \$900.00 to cover the above fees are enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 02-2135 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-2135. A duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Payment by credit card. (Form PTO-2038 enclosed.) NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: George R. Repper Rothwell, Figg, Ernst & Manbeck 555 13th St., N.W. Washington, D.C. 20004 Phone: 202/783-6040			 _____ Signature _____ George R. Repper Name _____ 31,414 Registration Number		

111/PRTS

SPECIFICATION

Portable Telephone

5 Technical Field

The present invention relates to a portable telephone and particularly, to a portable telephone of a diversity type that can be used in both of a continuous transmit/receive system performing continuous transmission/reception of a signal and a time-division transmit/receive system performing time-divisional transmission/reception of a signal.

Background Art

The PDC system, a kind of the TDMA system performing time-divisional transmission/reception of a signal, has been heretofore adopted in the portable telephone related industry. Furthermore, diversity techniques have been employed in which two antennas are provided for a portable telephone and receive speech data is reproduced on the basis of levels of signal received by the two antennas.

On the other hand, a transition from the above described PDC system to the W-CDMA system performing a continuous transmission/reception of a signal has been planned in connection with technologies of a portable telephone. During this transition, a time period is expected to come in which both systems of PDC and W-CDMA co-exist; therefore, it is also expected that the need arises for a dual mode portable telephone that can be used in both systems.

However, when the dual mode portable telephone is constructed from two equipments of respective both types in a simple combination, a resulted equipment becomes of a large size and especially, if the diversity techniques were implemented in each of both systems, 4 antennas would be required, which further increases an equipment size.

Disclosure of the Invention

It is accordingly an object of the present invention to provide a

portable telephone that can be used in both of the continuous transmit/receive system and the time-division transmit/receive system, in which systems a diversity technique can be realized, and which is capable of shrinking a size thereof.

5 The object of the present invention can be achieved by providing a portable telephone of a diversity type that can be used in both of a continuous transmit/receive system performing continuous transmission/reception of a signal and a time-division transmit/receive system performing time-divisional transmission /reception of a signal, including: first and second antennas provided spaced apart from each other; a first transmit/receive circuit for transmitting/receiving a signal to/from a base station for the continuous transmit/receive system; a second transmit/receive circuit for transmitting/receiving a signal to/from a base station for the time-division transmit/receive system; a judging circuit judging one of the continuous transmit/receive system and the time-division transmit/receive system as a main system and the other as a monitor system on the basis of receive signals of the first and second transmit/receive circuits; and a coupler coupling the first or second transmit/receive circuit corresponding to a system judged as a main system by the judging circuit with the first and second antennas in a main system operation in which a signal is transmitted/received to/from a base station for a main system, while coupling the first or second transmit/receive circuit corresponding to a system judged as a monitor system by the judging circuit with the first and second antennas in monitoring in which a signal is received from a base station for a monitor system.

 A main advantageous point of the present invention is that a portable telephone of the present invention can be used in both of the continuous transmit/receive system and the time-division transmit/receive system, in which systems diversity techniques can be realized, and which is capable of shrinking a size thereof since two antennas can be shared by both systems.

 It is preferable that the coupler includes: a first filter provided between the first antenna and the first transmit/receive circuit and passing

only a signal of the continuous transmit/receive system therethrough; a second filter provided between the first antenna and the second transmit/receive circuit and passing only a signal of the time-division transmit/receive system therethrough; and a switching circuit coupling the second antenna and the first transmit/receive circuit with each other in a case where the first transmit/receive circuit is used, while coupling not only the first antenna and the second transmit/receive circuit with each other through the second filter but also the second antenna and the second transmit/receive circuit with each other in a case where the second transmit/receive circuit is used. In this aspect, since the first antenna for use in transmission/reception of a signal and each of the first and second transmit/receive circuits are coupled through a filter, a power loss of the signal in transmission can be restricted to a low level. Furthermore, since the switch circuit can be integrated into circuitry, a size of an equipment can be shrunk.

It is further preferable that the coupler includes a first filter provided between the first antenna and the first transmit/receive circuit and passing only a signal of the continuous transmit/receive system therethrough; a second filter provided between the first antenna and the second transmit/receive circuit and passing only a signal of the time-division transmit/receive system therethrough; a circulator giving a receive signal to the second transmit/receive circuit through a second input/output port thereof, the receive signal being given to a first input/output port thereof through the first antenna and the second filter, while giving a transmit signal to the first antenna through the first input/output port thereof and the second filter, the transmit signal being given to a third input/output port thereof from the second transmit/receive circuit; and a switching circuit coupling the second antenna and the first transmit/receive circuit with each other in a case where the first transmit/receive circuit is used, while coupling the second antenna and the second transmit/receive circuit in a case where the second transmit/receive circuit is used. In this aspect, since the circulator is used, control of the switching circuit can be simplified.

It is still further preferable that the coupler includes: first and second filters, respectively, provided between each of the first and second antennas, and the first transmit/receive circuit and passing only a signal of the continuous transmit/receive system therethrough; third and fourth
5 filters, respectively, provided between each of the first and second antennas, and the second transmit/receive circuit and passing only a signal of the time-division transmit/receive system therethrough; and a circulator giving a receive signal to the second transmit/receive circuit through a second input/output port, the receive signal being given to a first input/output port
10 through the first antenna and the third filter, while giving a transmit signal to the first antenna through the first input/output port and the third filter, the transmit signal being given to a third input/output port from the second transmit/receive circuit. In this aspect, since the first to fourth filters and the circulator are used, a power loss is reduced and no control by
15 the coupler is necessary.

It is yet further preferable that the coupler includes: first and second filters, respectively, provided between each of the first and second antenna, and the first transmit/receive circuit and passing only a signal of the continuous transmit/receive system; third and fourth filters, respectively,
20 provided between the first and second antennas, and the second transmit/receive circuit and passing only a signal of the time-division transmit/receive system therethrough; and a switching circuit giving a transmit signal outputted from the second transmit/receive circuit to the first antenna through the third filter in transmission of the second
25 transmit/receive circuit, while giving a receive signal of the first antenna to the second transmit/receive circuit through the third filter in reception of the second transmit/receive circuit. In this aspect, since the first to fourth filters and the switch circuit are used, a power loss can be reduced and a size of an equipment can be shrunk.

It is further preferable that the first transmit/receive circuit generates receive speech data on the basis of receive signals from the first and second antennas and the second transmit/receive circuit selects a signal of a higher signal level of receive signals from the first and second
30

antennas and generates receive speech data on the basis of the selected receive signal. In this aspect, since receive signals from the first and second are combined or a signal of a higher signal level of the receive signals is selected, signal reception can be performed with high sensitivity.

5

Brief Description of the Drawings

Fig. 1 is a circuit block diagram representing a main part of a dual mode portable telephone according to a first embodiment of the present invention;

10

Fig. 2 is a frequency spectrum chart of signals of the W-CDMA system and the PCD system employed in the dual mode portable telephone shown in Fig. 1;

Fig. 3 is a table for describing operation of the dual mode portable telephone shown in Fig. 1;

15

Fig. 4 is a time chart for describing operation of the dual mode portable telephone shown in Fig. 1;

Fig. 5 is another time chart for describing operation of the dual mode portable telephone shown in Fig. 1;

20

Fig. 6 is a circuit block diagram representing an example modification of this embodiment;

Fig. 7 is a table for describing operation of the dual mode portable telephone shown in Fig. 6;

Fig. 8 is a circuit block diagram representing another example modification of this embodiment;

25

Fig. 9 is a table for describing operation of the dual mode portable telephone shown in Fig. 8;

Fig. 10 is a circuit block diagram representing still another example modification of this embodiment; and

30

Fig. 11 is a table for describing operation of the dual mode portable telephone shown in Fig. 10.

Best Mode for Carrying Out the Invention

Detailed description will be given of a dual mode portable telephone

relating to the present invention below with reference to the accompanying drawings.

Referring to Fig. 1, the dual mode portable telephone includes: a transmit/receive antenna 1; a receive antenna 2, band branching filters 3 and 6; switches SW1 to SW3; a W-CDMA transmit circuit 11; a W-CDMA receive circuit 12; a PDC transmit circuit 13; a PDC receive circuit 14; and a control circuit 15.

The transmit/receive antenna 1 is used in transmission/reception in both of the W-CDMA system and the PDC system. As shown in Fig. 2, a transmit signal Tx1 and receive signal Rx1 of the W-CDMA system have frequencies of the order of 2 GHz and a transmit signal Tx2 and receive signal Rx2 of the PDC system have frequencies of the order of 0.8 GHz. Since such signals of the two systems having respective different frequencies are transmitted/received, the transmit/receive antenna 1 has been constructed so as to have two resonance points. The receive antenna 2 also has two resonance points and is used in reception of signals of the W-CDMA system and the PDC system. With the two antennas 1 and 2 adopted, a diversity system is realized.

The band branching filter 3 includes: a high pass filter (HPF) 4; a low pass filter (LPF) 5; and three input/output ports 3a to 5a. The port 3a is connected to the transmit/receive antenna 1. The signals Tx1 and Rx1 of the W-CDMA system are transmittable through a route from the port 3a, to the high pass filter 4 and to the port 4a and the signals Tx2 and Rx2 of the PDC system are transmittable through a route from the port 3a, to the low pass filter 5 and to the port 5a.

The band branching filter 6 includes band pass filters (BPF) 7 and 8; and three port 6a to 8a. The ports 6a to 8a are connected to the port 4a of the band branching filter 3, an output terminal 11a of the W-CDMA transmit circuit 11 and a first input terminal 12a of the W-CDMA receive circuit 12, respectively. The receive signal Tx1 (1920 to 1980 MHz) of the W-CDMA system is transmittable through a route from the port 7a, to the band pass filter 7 and to the port 6a and the receive signal Rx1 (2110 to 2170 MHz) of the W-CDMA system is transmittable through a route from

the port 6a, to the band pass filter 8 and to the port 8a.

A common terminal T3a of the switch SW1 is connected to the receive antenna 2, a first switching terminal T1a is connected to a second switching terminal T2c of the switch SW3 and a second terminal T2a of the switch SW1 is connected to a second input terminal 12b of the W-CDMA receive circuit 12. The switch SW1 is switching-controlled by a control circuit 15. Definition is here given such that a state in which a route between terminals T1a and T3a is conductive is referred to as "state 1" and a state in which a route between terminals T2a and T3a is conductive is referred to as "state 2."

A common terminal T3b of the switch SW2 is connected to the port 5a of the band branching filter 3, a first switching terminal T1b thereof is connected to an output terminal 13a of a PDC transmit circuit 13 and a second switching terminal T2b thereof is connected to a first switching terminal T1c of the switch SW3. The switch SW2 is switching-controlled by the control circuit 15. Definition is again here given such that a state in which a route between the terminals T1b and T3b is conductive is referred to as "state 1" and state in which a route between the terminals T2c and T3c is conductive is referred to as "state 2."

The W-CDMA transmit circuit 11 is activated in a case where the W-CDMA system is a main system and a transmit signal Tx1 is generated according to transmit speech data generated on the basis of speech of a user of the portable telephone. The transmit signal Tx1 is given to the transmit/receive antenna 1 through the band pass filter 7 and the high pass filter 4.

The W-CDMA receive circuit 12 combines a signal Rx1 received by the transmit/receive antenna 1 and given through the high pass filter 4 and the band pass filter 8 and a signal Rx1' received by the receive antenna 2 and given through the switch SW1 to synthesize receive speech data. The receive speech data is converted to speech to transmit the speech to the user of the portable telephone.

Furthermore, the W-CDMA receive circuit 12 monitors information from the base station for the W-CDMA system on the basis of the receive

signals Rx1 and Rx1' in monitoring in a case of the PDC system is a main system. The reason why the information from the base station for the W-CDMA system is monitored in such a way is that swift transition to the W-CDMA system is realized when a signal level from the base station for the PDC system decreases.

The PDC transmit circuit 13 is activated in a case where the PDC system is a main system and a transmit signal Tx2 is generated according to transmit speech data. The transmit signal Tx2 is given to the transmit/receive antenna 1 through the switch SW2 and the low pass filter 5.

The PDC receive circuit 14 generates receive speech data in the main system operation in a case where the PDC system is a main system on the basis of a signal Rx2 received by the transmit/receive antenna 1 and given through the low pass filter 5 and the switches SW2 and SW3, or a signal Rx2 received by the receive antenna 2 and given through the switches SW1 and SW3.

Furthermore, the PDC receive circuit 14 monitors information from the base station for the PDC system on the basis of the signal Rx2 in monitoring in a case where the W-CDMA system is a main system. The reason why the information from the base station for the PDC system is monitored in such a way is that swift transition to the PDC system is realized when a signal level from the base station for the W-CDMA system decreases.

The control circuit 15 judges which of signal levels of the W-CDMA system and the PDC system is higher on the basis of signals from the receive circuits 12 and 14 and selects a system of a higher signal level as a main system, while specifying a system of a lower signal level as a monitor system. The control circuit 15 controls the switches SW1 to SW3, the transmit circuits 11 and 13, and the receive circuits 12 and 14.

Fig. 3 is a table for representing states of the switches SW1 to SW3. Description will be given of operation of the portable telephone below with reference to Fig. 3.

First of all, the receive signal Rx1 of the W-CDMA system and the

receive signal Rx2 of the PDC system are compared with each other by the control circuit 15 and a system of a higher signal level is selected as a main system, while a system of a lower signal level is specified as a monitor system.

5 In a case where the W-CDMA system is a main system and a telephone is in a conversation state, the switch SW1 enters "state 2" to allow a route between the terminals T2a and T3a to be conductive and the switches SW2 and SW3 is placed into a D/C state (Don't Care) in the main system operation. The signal Rx1 received by the antenna 1 is inputted to
10 the first input terminal 12a of the W-CDMA receive circuit 12 through the high pass filter 4 and the band pass filter 8 and along with the input of the signal Rx1, the signal Rx1' received by the antenna 2 is inputted to the second input terminal 12b of the W-CDMA receive circuit 12 through the switch SW1. The W-CDMA receive circuit 12 generates receive speech
15 data on the basis of the signals Rx1 and Rx1' from the two antennas 1 and 2. That is, a space diversity technique is realized.

 Furthermore, the signal Tx1 generated in the W-CDMA transmit circuit 11 is given to the antenna 1 through the band pass filter 6 and the high pass filter 4 and further transmitted to the base station for the W-
20 CDMA system from the antenna 1. In this case, as shown in Figs. 4(a) and 4(b), the transmit signal Tx1 is continuously transmitted and the receive signals Rx1 and Rx1' are also continuously received. For this reason, the W-CDMA system is called a continuous transmit/receive system.

 In a case where the W-CDMA system is a main system and a
25 telephone is in a conversation state, the switch SW1 assumes "state 1" in monitoring to cause a route between the terminals T1a and T3a to be conductive and the switch SW2 assumes "state 2" to cause a route between the terminals T2b and T3b to be conductive, and the switch SW2 assumes
30 "state 1" or "state 2" such that one of a higher signal level of the signal Rx2 received by the antenna 1 and the signal Rx2 received by the antenna 2 is inputted to the PDC received circuit 14. In this case, as shown in Figs. 4(c) and 4(d), outputting of the transmit signal Tx2 is ceased while the receive signal Rx2 is continuously received. The PDC receive circuit 14

monitors information from the base station for the PDC system on the basis of the receive signal Rx2.

In a case where the W-CDMA system is a main system and a telephone is in a call waiting state, the telephone is in the same state as in the conversation state.

In a case where the PDC system is a main system and the telephone is in a conversation state, the switch SW1 assumes "state 1" in the main system operation to cause a route between the terminals T1a and T3a to be conductive and the switch SW2 assumes "state 1" and "state 2" in transmission and reception, respectively, and the switch SW3 assumes "state 1" or "state 2" such that one of a higher signal level of the signal Rx2 received by the antenna 1 and the signal Rx2 received by the antenna 2 is inputted to the PDC receive circuit 14. The one of a higher signal level of the signal Rx2 received by the antenna 1 and the Rx2 received by the antenna 2 is inputted to the PDC receive circuit 14 and the PDC received circuit 14 generates receive speech data on the basis of the signal Rx2 inputted. That is, a space diversity technique is realized.

Furthermore, the signal Tx2 generated by the PDC transmit circuit 13 is given to the antenna 1 through the switch SW2 and the low pass filter 5 and further transmitted to the base station for the PDC system from the antenna 1. In this case, reception of the signal Rx2 and transmission of the signal Tx2 are alternately performed in a time divisional manner. That is, as shown in Figs. 5(c) and 5(d), the signal Rx2 is received in an R (reception) slot, nothing is performed in an I (idle) slot, the transmit signal Tx2 is transmitted in a T (transmission) slot, the signal Rx1 from the antenna 1 and a signal from the antenna 2 are compared with each other in regard to signal intensity in an LM (level measuring) slot to set a state of the switch SW3 and the signal Rx2 is received in the R slot. Therefore, the PDC system is called a time division transmit/receive system.

In a case where the PDC system is a main system and a telephone is in a conversation state, the switch SW1 assumes "state 2" in monitoring to cause a route between the terminals T2a and T3a to be conductive and the switches SW2 and SW3 assume the D/C state. The W-CDMA receive

circuit 12 monitors information from the base station for the W-CDMA system on the basis of the signal Rx1 and Rx1' from the antennas 1 and 2.

A case where the PDC system is a main system and a telephone is a standby receive state is basically the same as a case where the telephone is in the conversation state. Since no transmission is performed in the standby receive state, however, the switch SW2 has no chance to assume "state 1."

In this embodiment, using the band branching filter 3 and the switches SW1 to SW3, selective coupling is performed between the two antennas 1 and 2, and the W-CDMA receive system 11 and the W-CDMA transmit system 12 or between the two antennas 1 and 2, and the PDC receive system 13 and the PDC transmit system 14. Therefore, both of the W-CDMA system and the PDC system can be used and further a diversity technique is realized in both system and downsizing of the equipment can be achieved.

Note that why the transmit/receive antenna 1 and the W-CDMA transmit circuit 11 are coupled with each other through the filters 4 and 7 is that a power loss of a signal is restricted to a low level in transmission. Furthermore, the switches SW1 and SW3 can be integrated into circuitry with ease, thereby enabling downsizing of the equipment.

Description will be given of an example modification of this embodiment below. In an example modification of Fig. 6, the switch SW2 of Fig. 1 is replaced with a circulator 21. The circulator 21 includes three input/output ports 21a to 21c. The input/output port 21a to 21c are connected to the port 5a of the band branching filter 3, the first switching terminal T1c of the switch SW3 and the output node 13a of the PDC transmit circuit 13, respectively. The signal Rx2 received by the antenna 1, passing through the low pass filter 5 and inputted to the port 21a is given to the first switching terminal T1c of the switch SW3 through the port 21b. The signal Tx2 generated in the PDC transmit circuit 13 and inputted to the port 21c is given to the input/output port 5a of the band branching filter 3 through the port 21a. Hence, the circulator 21 plays the same role as does the switch SW2. The switches SW1 and SW3, as shown

in Fig. 7, are switching-controlled as is similar to the description with reference to Figs.1 and 3. In this example modification, since no control of the switch SW2 is necessary, simplification of control is realized.

5 In an example modification of Fig. 8, the switch SW1 of Fig. 6 is replaced with a band branching filter 22. The band branching filter 22 includes: a low pass filter 23; a high pass filter 24; and three input/output ports 22a to 24a. The receive signal Rx1' of the W-CDMA system is transmittable through a route from the port 22a, to the high pass filter 24 and to the port 24a, while the receive signal of the PDC system is
10 transmittable through a route from the port 22a, to the low pass filter 23 and to the port 23a. Therefore, the band branching filter 22 plays the same role as does the switch SW1. The switch SW3, as shown in Fig. 9, is switching-controlled as is similar to the description with reference to Figs.1 and 3. In this example modification, since neither the switch SW1 nor the
15 switch SW2 is necessary to be controlled, simplification of control is realized.

In an example modification of Fig. 10, the circulator 21 of Fig.8 is replaced with the switch SW2. The switches SW2 and SW3, as shown in Fig. 11, are switching-controlled as is similar to the description with
20 reference to Figs.1 and 3. In this example modification, since no control of the switch SW2 is necessary, simplification of control is realized.

CLAIMS

1. A portable telephone of a diversity type that can be used in both of a continuous transmit/receive system performing continuous
5 transmission/reception of a signal and a time-division transmit/receive system performing time-divisional transmission /reception of a signal, comprising:

first and second antennas (1, 2) provided spaced apart from each other;

10 a first transmit/receive circuit (6, 11, 12) for transmitting/receiving a signal to/from a base station for said continuous transmit/receive system;

a second transmit/receive circuit (SW3, 13, 14) for transmitting/receiving a signal to/from a base station for said time-division transmit/receive system;

15 a judging circuit (15) judging one of said continuous transmit/receive system and said time-division transmit/receive system as a main system and the other as a monitor system on the basis of receive signals of said first and second transmit/receive circuits (SW3, 6, 11 to 14); and

a coupler (4, 5, SW1, SW2, 21, 23, 24) coupling said first or second
20 transmit/receive circuit (6, 11, 12 or SW3, 13, 14) corresponding to a system judged as a main system by said judging circuit (15) with said first and second antennas (1, 2) in a main system operation in which a signal is transmitted/received to/from a base station for the main system, while coupling said first or second transmit/receive circuit (6, 11, 12 or SW3, 13,
25 14) corresponding to a system judged as a monitor system by said judging circuit (15) with said first and second antennas (1, 2) in monitoring in which a signal is received from a base station for a monitor system.

2. The portable telephone according to claim 1, wherein said
30 coupler (4, 5, SW1, SW2) comprises:

a first filter (4) provided between said first antenna (1) and said first transmit/receive circuit (6, 11, 12), passing a signal of said continuous transmit/receive system therethrough and suppressing a signal of said

time-division transmit/receive system;

a second filter (5) provided between said first antenna (1) and said second transmit/receive circuit (SW3, 13, 14), passing a signal of said time-division transmit/receive system therethrough and suppressing a signal of said continuous transmit/receive system; and

a switching circuit (SW1, SW2) coupling said second antenna (2) and said first transmit/receive circuit (6, 11, 16) with each other in a main system operation in case where said continuous transmit/receive system is a main system and in monitoring in a case where said time-division transmit/receive system is a main system, while coupling not only said first antenna (1) and said second transmit/receive circuit (SW3, 13, 14) with each other through said second filter (5) but also said second antenna (2) and said second transmit/receive circuit (SW3, 13, 14) with each other in a main system operation in case where said time-division transmit/receive system is a main system and in monitoring in a case where said continuous transmit/receive system is a main system.

3. The portable telephone according to claim 1, wherein said coupler (4, 5, 21, SW1) comprises:

a first filter (4) provided between said first antenna (1) and said first transmit/receive circuit (6, 11, 12), passing a signal of said continuous transmit/receive system therethrough and suppressing a signal of said time-division transmit/receive system;

a second filter (5) provided between said first antenna (1) and said second transmit/receive circuit (SW3, 13, 14), passing a signal of said time-division transmit/receive system therethrough and suppressing a signal of said continuous transmit/receive system;

a circulator having first to third input/output ports (3a to 5a), giving a receive signal to said second transmit/receive circuit (SW3, 13, 14) through said second input/output port (21b) thereof, said receive signal being given to said first input/output port (21a) thereof through said first antenna (1) and said second filter (5), while giving a transmit signal to said first antenna (1) through said first input/output port (21a) thereof and said

second filter (5), the transmit signal being given to said third input/output port (21c) thereof from said second transmit/receive circuit (SW3, 13, 14); and

5 a switching circuit (SW1) coupling said second antenna (2) and said first transmit/receive circuit (6, 11, 12) with each other in a main system operation in a case where said continuous transmit/receive system is a main system and in monitoring in a case where said time-division transmit/receive system is a main system, while coupling said second antenna (2) and said second transmit/receive circuit (SW3, 13, 14) with
10 each other in a main system operation in a case where said time-division transmit/receive system is a main system and in monitoring in a case where said continuous transmit/receive system is a main system.

4. The portable telephone according to claim 1, wherein said
15 coupler (4, 5, 21, 23, 24) comprises:

first and second filters (4, 24), provided between each of said first and second antennas (1, 2) respectively, and said first transmit/receive circuit (6, 11, 12), passing a signal of said continuous transmit/receive system therethrough and suppressing a signal of said time-division
20 transmit/receive system;

third and fourth filters (5, 23), provided between each of said first and second antennas (1, 2) respectively, and said second transmit/receive circuit (SW3, 13, 14), passing a signal of said time-division transmit/receive system therethrough and suppressing a signal of said continuous
25 transmit/receive system; and

a circulator having first to third input/output ports (21a to 21c), giving a receive signal to said second transmit/receive circuit (SW3, 13, 14) through said second input/output port (21b), said receive signal being given to said first input/output port (21a) through said first antenna (1) and said
30 third filter (5), while giving a transmit signal to said first antenna (1) through said first input/output port (21a) and said third filter (5), said transmit signal being given to said third input/output port (21c) from said second transmit/receive circuit (SW3, 13, 14).

5. The portable telephone according to claim 1, wherein said coupler (4, 5, 23, 24, SW2) comprises:

first and second filters (4, 24), respectively, provided between each of
5 said first and second antennas (1, 2), and said first transmit/receive circuit (6, 11, 12), passing a signal of said continuous transmit/receive system therethrough and suppressing a signal of said time-division transmit/receive system;

third and fourth filters (5, 23), respectively, provided between each of
10 said first and second antennas (1, 2), and said second transmit/receive circuit (SW3, 13, 14), passing a signal of said time-division transmit/receive system therethrough and suppressing a signal of said continuous transmit/receive system; and

a switching circuit (SW2) giving a transmit signal outputted from
15 said second transmit/receive circuit (SW3, 13, 14) to said first antenna (1) through said third filter (5) in transmission of said second transmit/receive circuit (SW3, 13, 14), while giving a receive signal of said first antenna (1) to said second transmit/receive circuit (SW3, 13, 14) through said third filter (5) in reception of said second transmit/receive circuit (SW3, 13, 14).

6. The portable telephone according to claim 1, wherein said first transmit/receive circuit (6, 11, 12) generates receive speech data on the basis of receive signals from said first and second antennas (1, 2) and

said second transmit/receive circuit (SW3, 13, 14) selects a signal of a
25 higher signal level of receive signals from said first and second antennas (1, 2) and generates receive speech data on the basis of the selected receive signal.

ABSTRACT

A dual mode portable telephone according to the present invention is a portable telephone of a diversity type that can be used in both of the W-
5 CDMA system and the PDC system and includes: a transmit/receive antenna (1); a receive antenna (2); a transmit circuit (11) and receive circuit (12) of the W-CDMA system; a transmit circuit (13) and receive circuit (14) of the PDC system; switches (SW1 to SW3) for selectively
10 coupling the antennas (1, 2) with the W-CDMA circuits (11, 12) or the PDC circuits (13, 14); and a band branching filter (3).

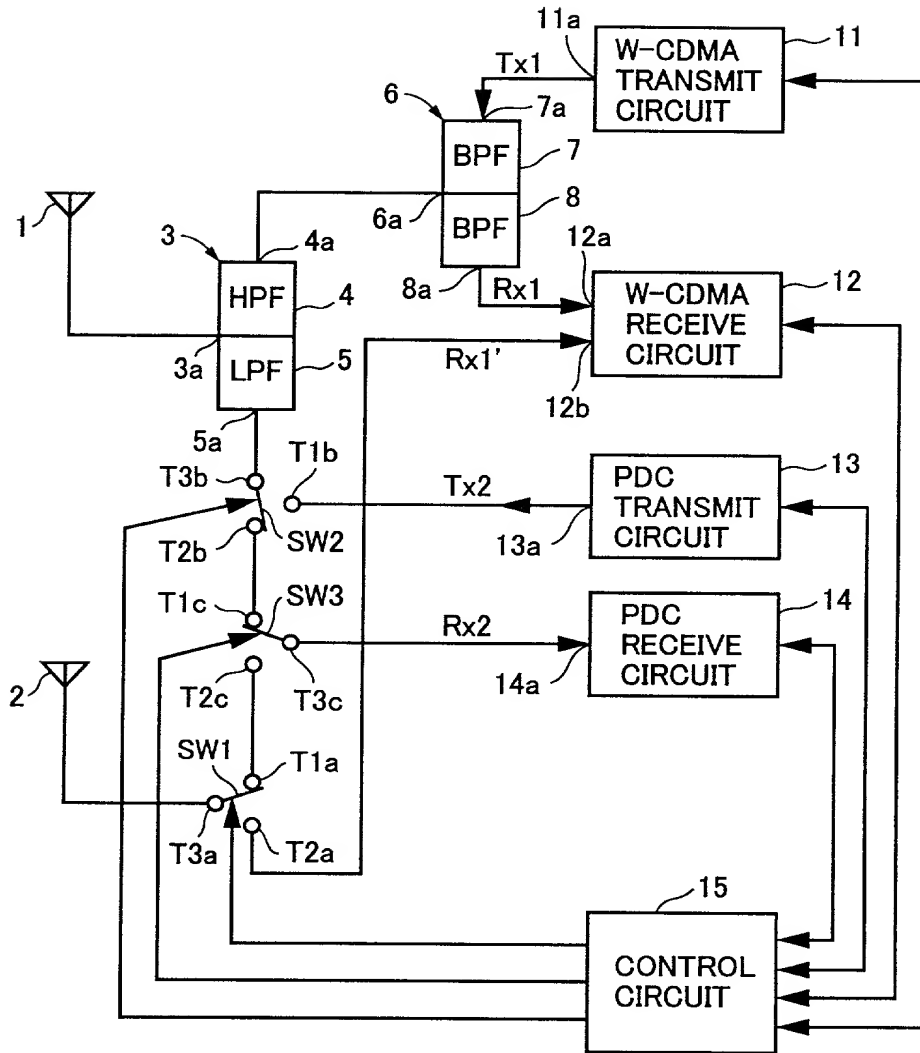
[illegible]

FIG. 2

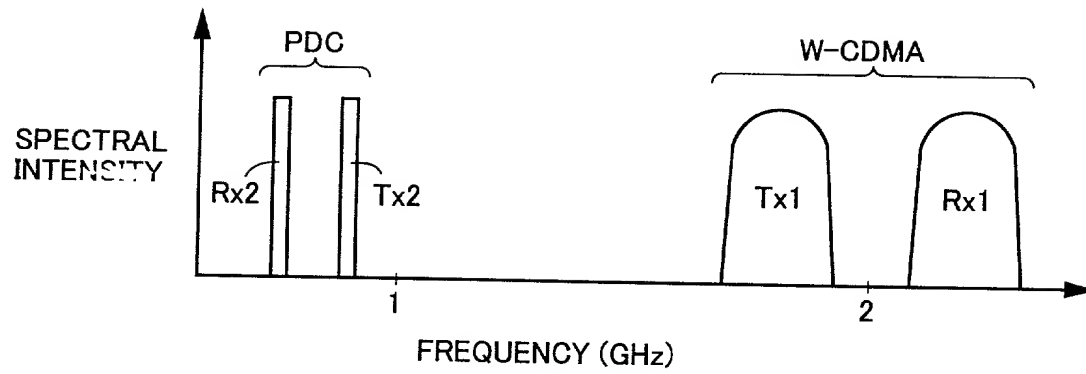


FIG. 3

MAIN SYSTEM	MONITOR SYSTEM	OPERATION STATE OF TELEPHONE	IN MAIN SYSTEM OPERATION			IN MONITORING		
			SW1	SW2	SW3	SW1	SW2	SW3
W-CDMA	PDC	CONVERSATION	2	D/C	D/C	1	2	1 OR 2
		STANDBY	2	D/C	D/C	1	2	1 OR 2
PDC	W-CDMA	CONVERSATION	1	1 OR 2	1 OR 2	2	D/C	D/C
		STANDBY	1	1	1 OR 2	2	D/C	D/C

FIG. 4

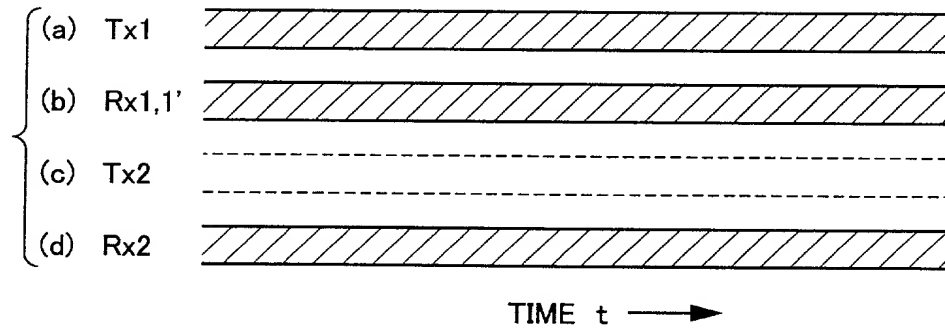


FIG. 5

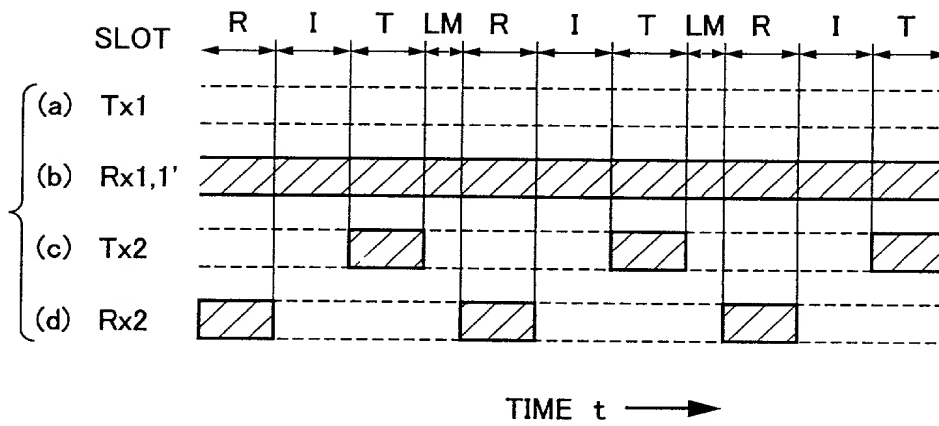


FIG. 6

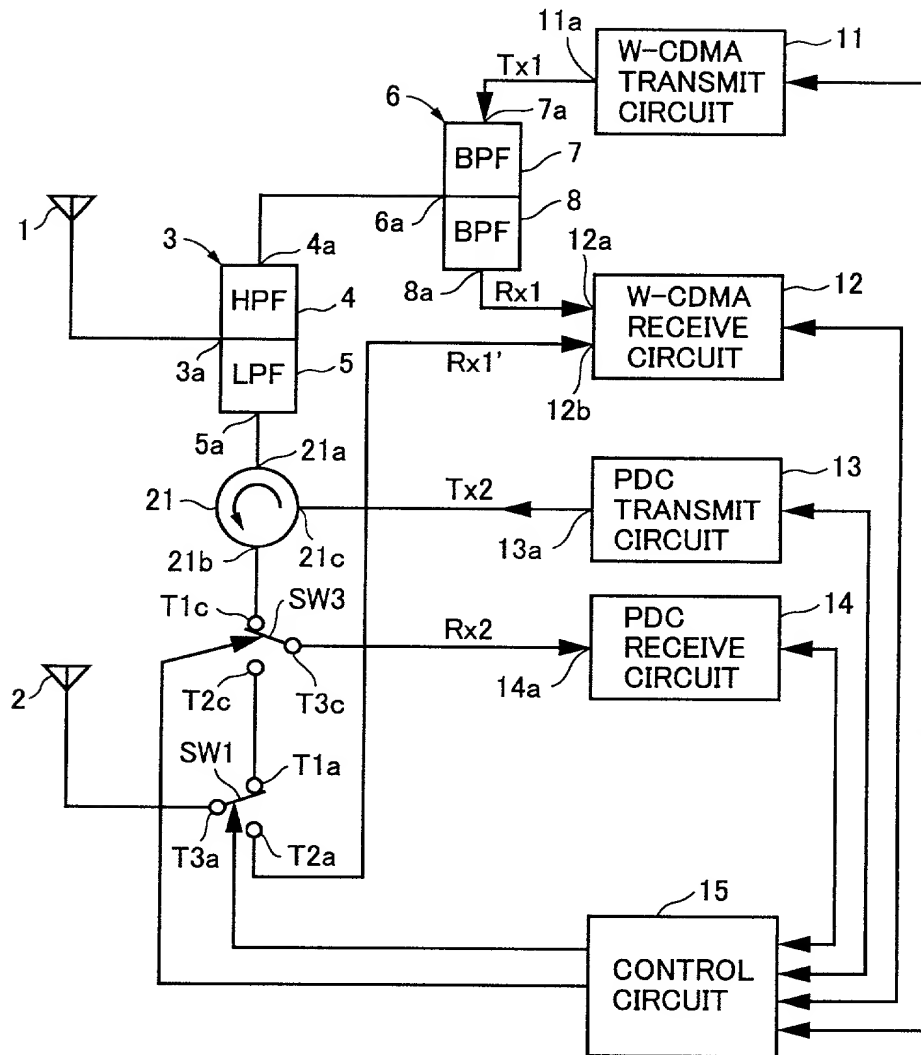


FIG. 7

MAIN SYSTEM	MONITOR SYSTEM	OPERATION STATE OF TELEPHONE	IN MAIN SYSTEM OPERATION			IN MONITORING	
			SW1	SW3	SW1	SW3	
W-CDMA	PDC	CONVERSATION	2	D/C	1	1 OR 2	
		STANDBY	2	D/C	1	1 OR 2	
PDC	W-CDMA	CONVERSATION	1	1 OR 2	2	D/C	
		STANDBY	1	1 OR 2	2	D/C	

FIG. 8

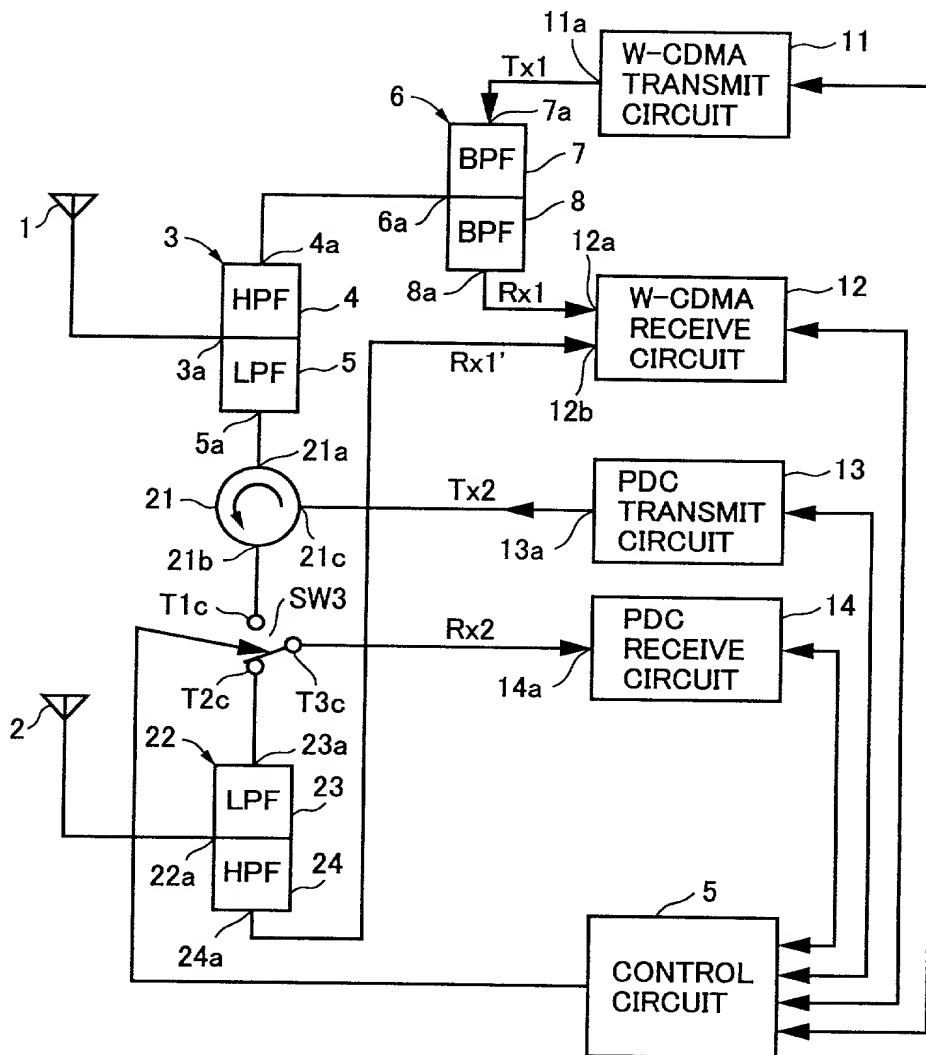


FIG. 9

MAIN SYSTEM	MONITOR SYSTEM	OPERATION STATE OF TELEPHONE	IN MAIN SYSTEM OPERATION	IN MONITORING
			SW3	SW3
W-CDMA	PDC	CONVERSATION	D/C	1 OR 2
		STANDBY	D/C	1 OR 2
	W-CDMA	CONVERSATION	1 OR 2	D/C
		STANDBY	1 OR 2	D/C

FIG. 10

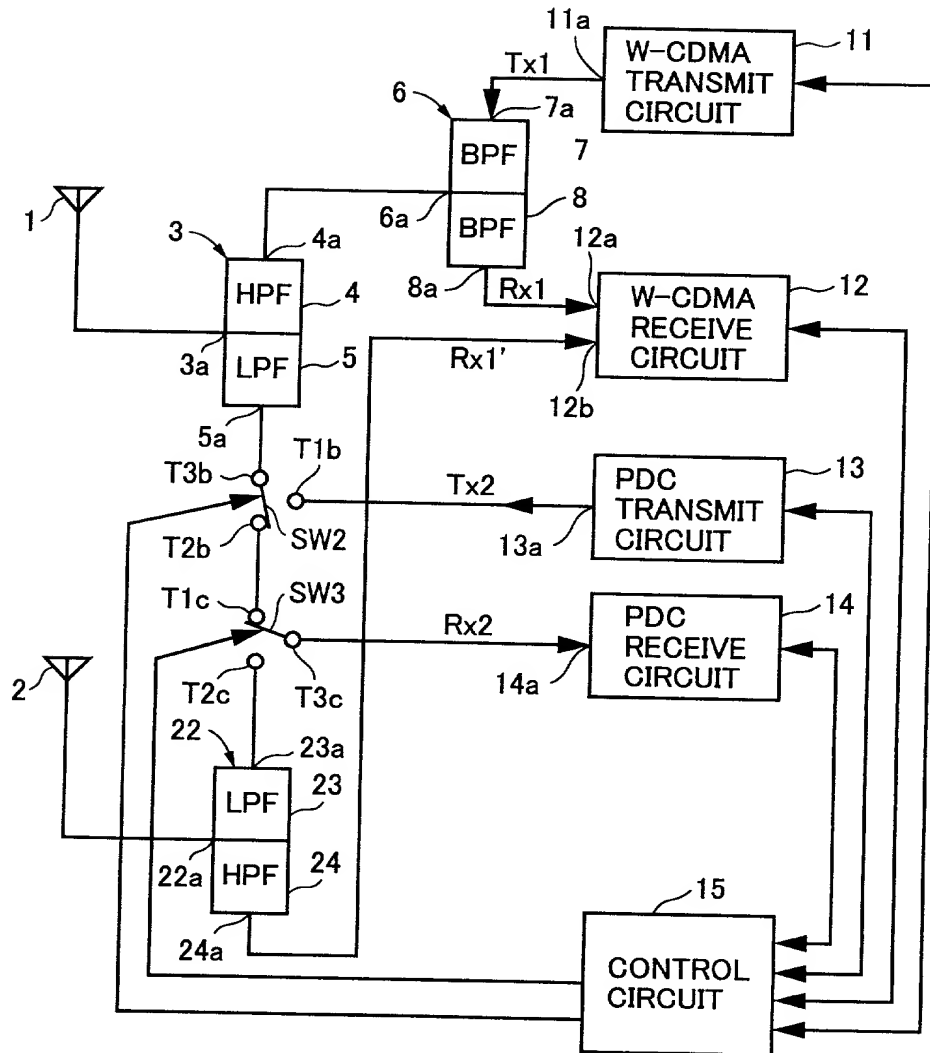


FIG. 11

MAIN SYSTEM	MONITOR SYSTEM	OPERATION STATE OF TELEPHONE	IN MAIN SYSTEM OPERATION			IN MONITORING	
			SW2	SW3	SW2	SW3	
W-CDMA	PDC	CONVERSATION	D/C	D/C	2		1 OR 2
		STANDBY	D/C	D/C	2		1 OR 2
PDC	W-CDMA	CONVERSATION	1 OR 2	1 OR 2	D/C		D/C
		STANDBY	2	1 OR 2	D/C		D/C

Declaration and Power of Attorney For Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

PORTABLE TELEPHONE

その明細書を
(該当する方に印を付す)

☐ ここに添付する。

☐ _____ 日に出願番号

第 _____ 号として提出し、

_____ 日に補正した。

(該当する場合)

the specification of which

(check one)

☒ is attached hereto.

☒ was filed on January 4, 2000 as

Application Serial No. PCT/JP00/00004

and was amended on _____
(if applicable)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Japanese Language Declaration

私は、合衆国法典第35部第119条にもとづく下記の外国特許出願または発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願を以下に明記する：

Prior foreign applications
先の外国出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

Priority claimed
優先権の主張

<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし

私は、合衆国法典第35部第120条にもとづく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の態様で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日またはPCT国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める：

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)
(Application Serial No.) (出願番号)	(Filing Date) (出願日)

(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)
(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)

私は、ここに自己の知識にもとづいて行った陳述がすべて真実であり、自己の有する情報および信ずるところに従って行った陳述が真実であると信じ、さらに故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁錮に処せられるか、またはこれらの刑が併科され、またかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損うことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration

委任状：私は、下記発明者として、以下の代理人をここに選任し、本願の手續を遂行すること並びにこれに関する一切の行為を特許商標庁に対して行うことを委任する、
(代理人氏名および登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

G. Franklin Rothwell, Reg. No. 18,125
E. Anthony Figg, Reg. No. 27,195
Barbara G. Ernst, Reg. No. 30,377
George R. Repper, Reg. No. 31,414
Bart G. Newland, Reg. No. 31,282
Vincent M. DeLuca, Reg. No. 32,408
Celine Jimenez Crowson, Reg. No. 40,357
Joseph A. Hynds, Reg. No. 34,627

Mark I. Bowditch, Reg. No. 40,315
Robert J. Jondle, Reg. No. 33,915
Kenneth M. Fagin, Reg. No. 37,615
Don M. Kerr, Reg. No. 22,720
Jeffrey L. Ihnen, Reg. No. 28,957
Stephen A. Saxe, Reg. No. 38,609
Glenn E. Karta, Reg. No. 30,649
Martha Cassidy, Reg. No. 44,066

書類の送付先:

Send Correspondence to:

Rothwell, Figg, Ernst & Manbeck
Suite 701, East Tower
555 13th Street, N.W.
Washington, D.C. 20004
U.S.A.

直通電話連絡先: (名称および電話番号)

Direct Telephone Calls to: (name and telephone number)

唯一のまたは第一の発明者の氏名	Full name of sole or first inventor	
	Hiroaki NAGANO	
同発明者の署名	日付	Inventor's signature Date
		Hiroaki Nagano July 13, 2001
住所	Residence	
	Hyogo, Japan JP	
国籍	Citizenship	
	Japanese	
郵便の宛先	Post Office Address	
	c/o Mitsubishi Denki Kabushiki Kaisha, 2-3, Marunouchi 2-chome, Chiyoda-ku, TOKYO 100-8310 JAPAN	
第2の共同発明者の氏名 (該当する場合)	Full name of second joint inventor, if any	
	Shinjiro FUKUYAMA	
同第2発明者の署名	日付	Second inventor's signature Date
		Shinjiro Fukuyama July 13, 2001
住所	Residence	
	Hyogo, Japan JP	
国籍	Citizenship	
	Japanese	
郵便の宛先	Post Office Address	
	c/o Mitsubishi Denki Kabushiki Kaisha, 2-3, Marunouchi 2-chome, Chiyoda-ku, TOKYO 100-8310 JAPAN	

(第六またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Declaration

第3の共同発明者の氏名(該当する場合)		Full name of third joint inventor, if any	
		Kenji ITOH	
同第3共同発明者の署名	日付	Third Inventor's signature	Date
		Kenji Itoh	July 18, 2001
住所		Residence	
		Hyogo, Japan	
国籍		Citizenship	
		Japanese	
郵便の宛先		Post Office Address	
		c/o Mitsubishi Denki Kabushiki Kaisha,	
		2-3, Marunouchi 2-chome,	
		Chiyoda-ku, TOKYO 100-8310 JAPAN	

第4の共同発明者の氏名(該当する場合)		Full name of fourth joint inventor, if any	
同第4共同発明者の署名	日付	Fourth Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

第5の共同発明者の氏名(該当する場合)		Full name of fifth joint inventor, if any	
同第5共同発明者の署名	日付	Fifth Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

第6の共同発明者の氏名(該当する場合)		Full name of sixth joint inventor, if any	
同第6共同発明者の署名	日付	Sixth Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

(第7またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for seventh and subsequent joint inventors.)